CLAIMS

What is claimed is:

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1. A shape memory alloy, comprising

(a) an effective amount of Mn;

(b) an effective amount of Si;

(c) from about 1% to about 8% Cr;

(d) an effective amount of N; and

(e) the balance of Fe.

2. A shape memory alloy of Claim 1, comprising from about 18% to about 35% Mn.

3. A shape memory alloy of Claim 2, comprising from about 20% to about 30% Mn.

4. A shape memory alloy of Claim 1, comprising from about 5.2% to about 8% Si.

5. A shape memory alloy of Claim 4, comprising from about 5.5% to about 6% of Si.

6. A shape memory alloy of Claim 1, comprising from about 2% to about 5% of Cr.

7. A shape memory alloy of Claim 1, comprising from about 0.1% to about 0.5% N.

8. A shape memory alloy of Claim 1, comprising from about 55% to about 75% Fe.

9. A shape memory alloy of Claim 8, comprising from about 61% to about 70% Fe.

10. A shape memory alloy of Claim 1, wherein said alloy demonstrates about 100% shape recovery with one cycle of thermo-mechanical training with a prestrain of about 3%.

11. A shape memory alloy comprising:

(a) from about 20% to about 30% of Mn;

(b) from about 5.5% to about 6% of Si;

(c) from about 1% to about 8% of Cr;

(d) from about 0.1 % to about 0.5% N; and

(e) from about 60% to about 70% Fe.

12. A shape memory alloy of Claim 11, comprising from about 2% to about 5% of Cr.

13. A shape memory alloy of Claim 11, comprising from about 0.1% to about 0.3% N.

14. A shape memory alloy of Claim 11, wherein said alloy demonstrates about 100% shape recovery with one cycle of thermo-mechanical training with a prestrain of about 3%.

15. A shape memory alloy of Claim 11, comprising about 20% Mn, about 5.5% Si, about 5% Cr, about 0.16% N, and the balance Fe.

16. A shape memory alloy of Claim 11, comprising about 25% Mn, about 5% Si, about 5% Cr, about 0.13% N, and the balance Fe.

17. A shape memory alloy of Claim 11, comprising about 30% Mn, about 6% Si, about 2% Cr, about 0.10% N, and the balance Fe.

18. A shape memory alloy according to Claim 1, consisting essentially of:

(a) from about 18% to about 35% of Mn;

(b) from about 5% to about 8% of Si;

(c) from about 1% to about 8% of Cr;

(d) from about 0.08 % to about 0.5% N; and

(e) the balance of Fe.

19. A shape memory alloy according to Claim 18, consisting essentially of:

(a) from about 20% to about 30% of Mn;

(b) from about 5.5% to about 6% of Si;

(c) from about 2% to about 5% of Cr;

(d) from about 0.1 % to about 0.3% N; and

(e) from about 61% to about 70% Fe.

20. In an iron-manganese-silicon-based shape memory alloy, the improvement comprising the addition to said alloy of from about 1% to about 8% Cr; and from about 0.1% to about 0.2% N.

21. A iron-manganese-silicon-based shape memory alloy of Claim 20, wherein said alloy comprises from about 18% to about 35% Mn; from about 5% to about 8% Si; and from about 55% to about 75% Fe.

22. A iron-manganese-silicon-based shape memory alloy of Claim 21, wherein said alloy comprises from about 20% to about 30% Mn; from about 5.5% to about 6% Si; from about 55% to about 75% Fe; from about 2% to about 5% of Cr; and from about 0.1 % to about 0.16% N.

23. A shape memory alloy of Claim 20, wherein said alloy demonstrates about 100% shape recovery with one cycle of thermo-mechanical training with a prestrain of about 3%.

24. A method of training a iron-manganese-silicon-based shape memory alloy containing Cr and N, comprising the steps of

(a) tensile deforming said alloy by applying from about 2.5% to about 4% prestrain at a temperature of from about 4°C to about 45° C;

(b) heating said alloy to a temperature of from about 500°C to about 700°C for at least about 2 minutes; and

(c) cooling said alloy.

25. A method according to Claim 24, wherein said tensile deforming step comprises applying from about 3.0% to about 3.5% prestrain at ambient temperature.

26. A method according to Claim 24, wherein said heating step is for from about 5 minutes to about 15 minutes, at a temperature of from about 550°C to about 650°C.

27. A method according to Claim 24, wherein said heating step is for about 10 minutes at about 600°C.

28. A method according to Claim 24, additionally comprising repeating said steps (a), (b), and (c).

29. A method according to Claim 28, wherein said repeating is performed twice.

30. A method according to Claim 24, wherein said alloy comprises:

(a) from about 18% to about 35% of Mn;

(b) from about 5% to about 8% of Si;

(c) from about 1% to about 8% of Cr;

(d) from about 0.1 % to about 0.5% N; and

(e) from about 55% to about 75% Fe.

31. A method according to Claim 30, wherein said alloy comprises:

(a) from about 20% to about 30% Mn;

(b) from about 5.5% to about 6% of Si;

(c) from about 2% to about 5% of Cr;

(d) 0.1% to about 0.4% N; and

(e) 61% to about 70% Fe.

32. A method according to Claim 31, wherein said alloy comprises about 20% Mn, about 5.5% Si, about 5% Cr, about 0.16% N, and the balance Fe.

33. A method according to Claim 31, wherein said alloy comprises about 25% Mn, about 5% Si, about 5% Cr, about 0.13% N, and the balance Fe.

34. A method according to Claim 31, wherein said alloy comprises about 30% Mn, about 6% Si, about 2% Cr, about 0.10% N, and the balance Fe.

35. A method according to Claim 24, wherein said alloy demonstrates about 100% shape recovery with a prestrain of about 3%.

36. A iron-manganese-silicon-based shape memory alloy trained by the method of Claim 24. 2173,058